

Code No: 07A4EC17

R07**Set No. 2**

II B.Tech II Semester Examinations, December 2010
PRINCIPLES OF COMMUNICATIONS
Common to Bio-Medical Engineering, Electronics And Computer
Engineering

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
 All Questions carry equal marks

1. (a) Explain
 - i. Lossless channel
 - ii. Deterministic channel
 - iii. Binary Symmetric channel.
 (b) Prove that the channel capacity of a channel of infinite bandwidth with white Gaussian noise is finite. [9+7]
2. The rms voltage of a carrier wave is 5 volts before modulation and 5.9 volts after modulation. What is the percentage of modulation? Calculate the modulated power if the unmodulated power is 2kw. [16]
3. (a) Determine the output of a DPSK transmitter for the data input 1011011100.
 (b) Draw the phasor diagram and constellation diagram of a 4PSK signal.
 (c) Distinguish between baseband and carrier modulation. [6+6+4]
4. (a) Show that the nonzero code polynomial of minimum degree in a cyclic code C is unique.
 (b) Find a generator polynomial $g(x)$ for a (7, 4) cyclic code?
 (c) Consider a (7, 4) cyclic code with $g(x) = 1+x+x^3$.
 - i. Let data word $d=(1010)$. Find the corresponding code word.
 - ii. Let the code word $c=(1100101)$. Find the corresponding data word.
 [5+5+6]
5. (a) Derive an expression for SNR of a PCM system using uniform quantization.
 (b) Distinguish between uniform and non uniform quantization. [10+6]
6. (a) Explain the functionality of block diagram of electrical communication system.
 (b) The carrier performs certain functions in radio communications. What are they? [8+8]
7. A wideband FM system uses a carrier wave of amplitude 10v and frequency 100MHz. The modulating signal has a bandwidth of 5 kHz and mean square value of 50. The frequency sensitivity K_f is 250Hz/volt and maximum carrier frequency deviation is 75 kHz. The uniform noise power density on the channel is 10^{-5} . Find the transfer function of the band pass filter (ideal) at the receiver input. [16]

Code No: 07A4EC17

R07

Set No. 2

8. Two signals band limited to 3 and 5 kHz are to be time division multiplexed. Find the maximum permissible interval between two successive samples. [16]

FIRSTRANKER

Code No: 07A4EC17

R07**Set No. 4**

II B.Tech II Semester Examinations, December 2010
PRINCIPLES OF COMMUNICATIONS
Common to Bio-Medical Engineering, Electronics And Computer
Engineering

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
 All Questions carry equal marks

1. Prove the following convolution laws:
 - (a) Commutative law,
 - (b) Associative Law, and
 - (c) Distributive law. [5+6+5]
2. (a) What is the significance of coding? Explain the principles of any one type of source code.
- (b) Derive expression for channel capacity for infinite bandwidth.
- (c) A source is delivering 3 messages with probabilities $1/2$, $1/4$, $1/4$ What is the entropy of second order source. [6+6+4]
3. (a) What do you understand by error control coding? Explain the various methods briefly.
- (b) What are cyclic codes? Explain the algebraic structure of cyclic codes. [8+8]
4. (a) Explain the basic features of Delta modulation system. What are its merits and demerits?
- (b) Discuss the various practical sampling methods. [8+8]
5. A single-tone FM signal is given by $e_{FM} = 10\sin(16\pi \times 10^6 t + 20\sin 2\pi \times 10^3 t)$ volts find the modulation index, modulating frequency deviation, carrier frequency and the power of the FM signal. [16]
6. Derive and explain the generation of modulator system in DSB-SC balanced modulator using diodes and transistors with circuits. [16]
7. Explain how PWM signals are generated from direct method. [16]
8. (a) Explain in detail the power spectra and bandwidth efficiency of m-ary FSK signals.
- (b) Find the output of the matched filter and determine the maximum value of $(S/N)_0$ if the input $s(t)$ is a rectangular pulse of amplitude A and duration T. [8+8]

Code No: 07A4EC17

R07**Set No. 1**

II B.Tech II Semester Examinations, December 2010
PRINCIPLES OF COMMUNICATIONS
Common to Bio-Medical Engineering, Electronics And Computer
Engineering

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
 All Questions carry equal marks

1. (a) Find the probability of symbols in a binary symmetric channel to have maximum entropy?
 (b) A discrete memory less source X has five likely symbols Construct a Shannon fano code and calculate the efficiency of the code. [8+8]
2. State and prove the sampling theorem (frequency domain). [16]
3. Explain the different types of angle modulation techniques. [16]
4. (a) Design a linear block code with a minimum distance of 3 and a message block size of 8 bits and find first five code words.
 (b) Distinguish block codes and convolutional codes. [10+6]
5. An amplitude-modulated voltage is given by $v = 50(1 + 0.2\cos 100t + 0.01 \cos 3500t) \cos 10^6 t$. State all frequency components (in Hz) present in the voltage, and find the modulation index for each modulating voltage term. What is the effective modulation index of v ? [16]
6. (a) What are the limitations of Fourier Transform?
 (b) State and explain the Dirchlet conditions, in Fourier series. [8+8]
7. (a) With a neat block diagram explain the working of a DPCM system.
 (b) The bandwidth of signal input to the PCM is restricted to 4KHz. The input varies from -3.8v to +3.8v and has average power of 30mW. The required SNR is 20dB. The modulator produces binary output. Assume uniform quantization.
 - i. Calculate the number bits required per sample
 - ii. Outputs of 30 such PCM Coders are time Multiplexed. What is the minimum required transmission bandwidth for the multiplexed signal. [8+8]
8. (a) Compare QAM and QPSK digital modulation schemes.
 (b) Binary data is transmitted at a rate of 10^6 bits/sec over a channel having a BW of 3 MHz. Assume that the noise PSD at the R_x is $\frac{N_0}{2} = 10^{-10}$ W/Hz. Find the average carrier amplitude required at the R_x input for coherent PSK and DPSK signaling schemes to maintain $P_e < 10^{-4}$. [8+8]

Code No: 07A4EC17

R07**Set No. 3**

II B.Tech II Semester Examinations, December 2010
PRINCIPLES OF COMMUNICATIONS
Common to Bio-Medical Engineering, Electronics And Computer
Engineering

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
 All Questions carry equal marks

1. Explain about the effect of the modulation index β on bandwidth. [16]
2. (a) Sketch the binary ASK, FSK, PSK, and QPSK waveform for the following sequence 1011.
- (b) A received signal is $\pm 1\text{mv}$ for T_b second intervals with equal probability. The signal is accompanied by white Gaussian noise with a psd of 10^{-10} Watt/Hz. The receiver integrates the signal plus noise synchronously for T_b second duration and decodes the signal by comparing the integrator output with 0. Find the maximum signaling rate (Minimum value of T_b) such that $P_e=10^{-4}$. [12+4]
3. (a) Define and discuss
 - i. Mutual information
 - ii. Average information.
 - iii. Channel matrix
- (b) What are the characteristic features of Shannon's theorem and Shannon-Hartley law? [9+7]
4. Show that the collector circuit efficiency in a collector modulation remains unchanged after modulation. [16]
5. (a) Draw the PCM Transmitter and receiver block diagrams and explain briefly the functioning.
- (b) The T1 carrier system used in digital telephony multiplexes 24 voice channels based on 8-bit PCM. Each voice signal is usually put through a lowpass filter with cutoff frequency of about 3.4 KHz. The filtered voice signal is sampled at 8KHz. In addition, a single bit is added at the end of the frame for the purpose of synchronization. Calculate
 - i. the duration of each bit
 - ii. the resultant transmission rate and
 - iii. the minimum required transmission bandwidth. [10+6]
6. Explain
 - (a) exhaustive search method
 - (b) majority logic decoding of a convolutional code. Mention its disadvantages. [16]

Code No: 07A4EC17

R07

Set No. 3

7. It is required to transmit telephone messages across the United States, a 3000 km run. The signal level is not to be allowed to drop below 1 millivolt before amplification and the signal is not to be allowed to be larger than 15 volts In order to avoid amplifier overload. Assuming that repeaters are to be located with equal spacings, how many repeaters will be required. [16]
8. Prove that Power spectral density function $S(\omega)$ and autocorrelation function of a power signal are Fourier transform pair $R(\Gamma) \leftrightarrow S(\omega)$. [16]

FIRSTRANKER